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Abstract. Results of national and pan-European consumer surveys and the growth in the demand for so-called "animal friendly" food products suggest that consumers within the European Union show a high level of concern for the welfare of farm animals. This paper analyses the determinants of British consumers' behaviour towards animal welfare using structural equation models (SEM) with observed and latent variables. SEM is a statistical technique for testing and estimating relationships amongst variables, using a combination of statistical data and qualitative causal assumptions. We used a data set collected in 2005 through face-to-face interviews of 654 consumers in England. We analysed the range of statements in existing literature on consumers' behaviour towards animal welfare and then used SEM to test and estimate these *a priori* determinants of behaviour. The models include observed and latent variables representing behaviour (stated purchases of free-range and organic chicken meat) and its underlying determinants (attitudes towards animal welfare and socio-economic factors). The models have an adequate overall fit to the data. The significance tests for the structural equation model on free-range chicken meat purchasing behaviour show socio-economic group, education, attitudes towards animal welfare, reasons for buying chicken meat, access to information on animal welfare issues, number of children and price as significant determinants. All of these (with the exception of reasons for buying chicken meat) were found significant also in the model on organic chicken meat purchasing behaviour.

Keywords: animal welfare, consumers' behaviour, structural equation models.

1. Introduction

Perceptions of animal welfare are essentially subjective and derived from society's moral and ethical values[2]. The results of national and pan-European consumer surveys and the growth in the demand for so-called "animal friendly" food products (*e.g.*, free-range eggs or free-range chicken meat) suggest that consumers within the European Union show a high level of concern for the welfare of farm animals (many of these studies are reviewed in [4] and [2]). However, according to [4] only few studies have subjected the level of concern across EU member states to a serious scrutiny. [3] cite surveys which find that 80 percent of EU consumers are concerned about animal welfare but that only 5 percent of consumers include animal welfare as one of their major concerns regarding the food they consume. [22] cite empirical evidence which suggests that consumers' willingness to pay a higher price for products subject to enhanced animal welfare standards does not translate into real behaviour in the market. [4] note that the market price paid for these products is often lower than the hypothetical willingness to pay stated in a contingent valuation analysis. Food safety features as a more prominent issue for consumers than animal welfare and consumers' choices of food (*e.g.*, of organic chicken meat) are often based on a perception of a link between good animal welfare and good food safety [19]; [21].

Consumption of welfare-friendly food products and its determinants (*e.g.*, socio-demographic, economic, information access, ethical, attitudinal) have certainly been the research topic of many studies and several aspects of it were analysed either through the use of stated or revealed preferences methods, theory of planned behaviour or other quantitative and qualitative methods [2]; [23]; [6]; [17]; [14]; [7].

This paper analyses some of the factors identified in the literature as influencing UK consumers' behaviour as regards animal welfare, and makes a comparison between their impacts on the stated consumption of free-range chicken meat and organic chicken meat. The paper is organised as follows: Section 2 briefly reviews the literature on determinants of consumption of welfare-friendly food products. Section 3 describes the survey data and the methodology (structural equation modelling). Section 4 discusses the results and Section 5 presents some conclusions.

2. Determinants of consumption of welfare-friendly food products

The literature mentions socio-demographic (education, age, gender, number of children in the household), economic factors (income), access to information on welfare issues and trust in the information provided on food product labels, welfare attitudes and perceptions, perceptions of links between welfare, food safety and environment and ethical values amongst the main determinants of consumers' welfare-friendly behaviour.

Research into consumer *welfare attitudes* has highlighted that in most instances stated concern over animal welfare does not translate into purchase decisions. This suggests that the public act as citizens in terms of their stated preferences and that dissonance arises when they act as consumers [15]. Several studies analysed the reasons for this discordance. [10] state that there is a number of perceived barriers to ethical choice, which include lack of *information*, a perceived lack of availability of higher welfare products, a *perception of insignificant influence over welfare standards*, disassociation from animal productions and slaughter, and perceived higher *costs*. They note that consumers say they do not consider *price* to be the most important factor in food choice, however this does not seem to be the case at the point of purchase. Because of the credence nature of animal welfare, *trust in the information* provided about the ways in which animal-based foods are produced is another key factor influencing consumer behaviour. The level of *trust* is determined by the perceived reliability of the information source and the means of certification employed by that source to ensure that the food products comply with the asserted welfare standards. There is evidence that EU consumers are sceptical about labels on food products and that this may act as a barrier to changes in their food purchasing behaviour [11]. However, consumers may use mistrust in information as an excuse of their unwillingness to change their purchasing behaviour in line with their alleged concerns. Other studies on attitudes towards ethical foods (*e.g.*, welfare friendly and organic food products) found consumer *trust* in the products and perceived *health* benefits acting as major drivers [16].

Consumer choices of food are frequently based on a *perception of a link between animal welfare, protection of the environment and food safety*. Some of the public's concern about animal welfare may be based on the assumption that good animal welfare improves food safety. Surveys undertaken in the EU show that consumers often state that animal welfare issues are important to them in making purchasing decisions, although sometimes these are of secondary importance compared to *food safety, taste and nutrition* [19]. Although consumers often perceive food safety and animal welfare as linked, in some cases the two issues can become dissociated: some consumers view chicken meat as *healthier* than other meat types (largely due to the belief that it contains less fat and fewer unsafe substances), while they are aware that the welfare of poultry might be lower [19].

Some consumers are concerned with a range of *'civic'* issues, including animal welfare in conjunction with *environmental concerns*, which can also influence purchasing decisions [19]. Consumers' perception of a link between food safety, environmental issues and animal welfare is most apparent in the context of organic animal agriculture [19]. The main interest of consumers in organic agriculture relates to assumed beneficial effects on the environment or health, through lower use of chemicals (medication, pesticides and fertilisers). However, concern about animal welfare issues (or about the impact of the animal's quality of life on the food product) appears to be one of the reasons why consumers purchase organic animal products, especially in the UK, despite the fact that compliance with standards for organic agriculture does not necessarily improve either animal health or animal welfare or reduce environmental impact.

Another important issue is whom the consumers view to be *responsible* for ensuring a satisfactory treatment of animals in food production as, according to [4], consumers will purchase products associated with animal welfare if they feel personally responsible for ensuring that animals are well treated in the

production process and/or that their purchasing behaviour will make a difference for the welfare of these animals.

According to [13], organic foods purchasing behaviour is influenced by age, gender, socio-economic group, number of young children in the household and location. [17] also found socio-economic group as a determinant of welfare-friendly behaviour of consumers.

3. Methodology

3.1. Data

Central to the empirical analysis in this paper is a cross-section database containing data collected in 2005 through face-to-face interviews of 654 consumers in England. The database is the result of two surveys completed during a DEFRA funded project "Estimating non-market benefits of reduced stocking density and other welfare increasing measures for meat chickens in England". One survey administered a choice experiment (CE) questionnaire completed by 336 respondents, while the other applied contingent valuation method (CVM) on a sample of 318 respondents. With the exception of the CE and CVM questions, all the other questions in the CE and CVM questionnaires were identical. We created the database by pooling together the data on all variables (with the exception of the CE and CVM questions) for the total of 654 observations.

The database includes data on purchase behaviour – frequency, amount spent per week-, frequency of meat consumption, frequency of chicken meat consumption, frequency of free-range and organic chicken meat consumption, concern about the welfare of different farmed animals, access to welfare information, reasons for buying chicken rather than other meat (health, better value, versatility, taste, origin, price, appearance), attitudes about the welfare of chickens, responsibility for the welfare of farmed animals (farmers, consumers, government, supermarkets), income, gender, age, socio-economic class, number of adults in household, number of children in household, working status, highest level of formal education achieved. As most of the respondents refused to state their income, we removed this variable from the database.

3.2. Structural equation modelling with observed and latent variables

To test the factors influencing welfare-friendly purchasing behaviour of consumers we employ a structural equation model (SEM) with observed and latent variables. SEM is a statistical technique for testing and estimating causal relationships amongst variables, some of which may be latent [5] using a combination of statistical data and qualitative causal assumptions. Latent variables (also known as hidden variables, hypothetical variables or hypothetical constructs) are variables that are not directly observed but are inferred from other variables that are observed and directly measurable. One advantage of using latent variables is that it reduces the dimensionality of data. A large number of observable variables can be aggregated in a model to represent an underlying concept. Latent variables are thus variables at the construct level, an intermediate level between theory and data. "It is generally agreed that no one 'invented' SEM. […] modern SEM evolved out of the combined efforts of many scholars pursuing several analytical lines of research. [5] proposed that SEM is founded on three primary analytical developments: (1) path analysis, (2) latent variable modelling, and (3) general covariance estimation methods" ([8], p. 5). While the idea of causality may be controversial [18], SEM is not intended to discover causes but to assess the soundness of the causal relationships researchers formulate.

SEM is most commonly used for confirmatory rather than exploratory modelling and thus, it is applied more to theory testing than theory development. It generally starts with a hypothesis, represents it as a model, operationalises the constructs of interest with a measurement instrument, and tests the model. The basic SEM consists of two parts, namely the measurement model specifying the relationships between the latent variables and their constituent indicators, and the structural equation model designating the causal relationships between the latent variables.

The model is defined by the following system of three equations in matrix terms (1) [12]:

The structural equation model: $\eta = B\eta + \Gamma\xi + \zeta$

The measurement model for y: $\quad y = \Lambda_y \eta + \varepsilon$

The measurement model for x: $\quad x = \Lambda_x \xi + \delta$ $\hspace{3cm}$ (1)

Where: η is an mx1 random vector of endogenous latent variables; ξ is an nx1 random vector of exogenous latent variables; B is an mxm matrix of coefficients of the η variables in the structural model; Γ is an mxn matrix of coefficients of the ξ variables in the structural model; ζ is an mx1 vector of equation errors (random disturbances) in the structural model; y is a px1 vector of endogenous variables; x is a qx1 vector of predictors or exogenous variables; Λ_y is a pxm matrix of coefficients of the regression of y on η; Λ_x is a qxn matrix of coefficients of the regression of x on ξ; ε is a px1 vector of measurement errors in y; δ is a qx1 vector of measurement errors in x.

SEM takes into account both direct and indirect causal relations between constructs, which means that one causal relation may be reinforced or counteracted by another. There could be more than one way to depict the interlinkages amongst the latent variables. Running alternative models and comparing them with the proposed model may provide additional evidence that the chosen model is the best in representing the reality.

We undertake SEM with categorical variables defined on ordinal scales (Likert scale) using the statistical package Lisrel 8.50 [12]. SEM estimation is performed by minimising the discrepancy between the covariance matrix of observed variables, and the theoretical covariance matrix predicted by the model structure [5]. The recommended method consistent with the sample size (n=654, a sample size which falls within standard limits for use within SEM) is the normal-theory maximum likelihood (MLE) method [5]. No variable was found to have significant departure from normality or pronounced kurtosis, therefore all variables were considered suitable for inclusion in the model.

In the remaining of this section we identify the latent variables structuring the model and their constituent indicators, and then validate the construction of the latent variables by means of factor analysis.

Indicators and latent variables

We identified and extracted seven latent variables in each of the two models, expressing the behaviour and the underlying determining factors. The variables are: consumption of free-range/organic chicken meat (awcons), welfare attitudes (attidaw), socio-economic group (class), perception of the price (price), reasons for buying chicken meat (reason), access to information (info), 'number of children under 18 years of age living in the household' (children). The seven latent variables are measured by 14 indicators (the constituent observed variables). Table 1 presents a series of descriptive statistics for the indicators of the latent variables included in both models.

Table 1. Descriptive statistics

	Mean	Std. Deviation
Can you remember seeing or hearing any reports on the welfare of meat chickens in newspapers or on radio or television? (infoaw)	2.08	1.650
Reason for buying chicken rather than other meat - chicken is healthier (reason1)	4.05	.926
Reason for buying chicken rather than other meat - chicken is quick and easy to cook (reason2)	4.18	.791
Reason for buying chicken rather than other meat - chicken is versatile (reason3)	4.28	.704
Reason for buying chicken rather than other meat - chicken is tasty (reason4)	4.08	.898
I am concerned about farm animal welfare (attidaw1)	3.91	.958
I am concerned about meat chicken welfare (attidaw2)	3.87	.984
Concern for animal welfare affects my purchase decisions (attidaw3)	3.30	1.209
Meat from higher welfare chicken is too expensive (expens)	3.89	1.299

How many children under 18 years of age live in your household? (child)	.78	1.085
Socio-economic group (segroup)	2.38	1.110
What is the highest level of formal education you have achieved? (educ)	2.44	1.303
If you have consumed chicken recently, how often was it free-range chicken? (awcons1)	2.70	2.159
If you have consumed chicken recently, how often was it organic chicken? (awcons2)	1.81	1.622

The behavioural latent variables 'consumption of free-range chicken meat' (awcons) and 'consumption of organic chicken meat' (awcons) are single indicator latents measured by the indicator 'consumption of free-range chicken meat' (awcons1) and, respectively 'consumption of organic chicken meat' (awcons2) using a six-point Likert scale, namely responses scored from 1 to 6 from 'never' to 'weekly or more'.

The attitude latent variable 'welfare attitudes' (attidaw) is measured by the indicators: concern about farm animal welfare (attidaw1), concern about meat chicken welfare (attidaw2) and concern for animal welfare affecting purchase decisions (attidaw3). The three variables are ordinal using a five-point Likert scale from 'strongly disagree' to 'strongly agree'.

The socio-economic latent variable 'socio-economic group' (class) is measured by the indicators: socio-economic group (segroup) and highest level of formal education achieved (educ). Indicator segroup is a categorical variable taking value 1 for social grade DE, value 2 for social grade C2, value 3 for social grade C1 and value 4 for social grade AB. Indicator educ is a categorical variable taking value 1 for no formal qualifications, value 2 for CSE, O or GCSE levels, value 3 for A levels, value 4 for university/college degree/diploma, value 5 for postgraduate or professional qualification.

The attitudinal latent variable 'perception of the price' (price) is a single indicator latent measured by the indicator 'perception of meat from higher welfare chicken as too expensive' (expens) measured on a five-point Likert scale from 'strongly disagree' to 'strongly agree'.

Latent variable 'reasons for buying chicken meat' (reason) is measured by four indicators: chicken is healthier (reason1), chicken is quick and easy to cook (reason2), chicken is versatile (reason3) and chicken is tasty (reason4). The four variables are ordinal using a five-point Likert scale from 'strongly disagree' to 'strongly agree'.

Latent variable 'access to information' (info) is a single indicator latent based on 'acknowledgement of welfare information in the media' (infoaw), which is measured on a five-point Likert scale from 'cannot recall seeing anything in last year' to 'recall seeing welfare reports in the past year/six months/three months/last month (values 0 to 4).

Latent variable 'number of children under 18 years of age living in the household' (children) is an observed variable built into the model as a single indicator latent variable measured by 'number of children in the household' (child), which is a categorical variable taking values from 0 (no children) to 4 (four or more children).

Validation of Latent Variables Using Factor Analysis

As a test of the validity of the latent variables, we undertook factor analysis with varimax rotation (orthogonal rotation method that minimises the number of variables that have high loadings on each factor). Each set of variables loaded onto a separate factor, and only seven factors were retained in each of the two models, such that these seven factors could be taken to represent the relevant latent variables (Tables 2 and 3).

Table 2. Factor analysis for 'free-range' SEM

	Component						
	1	2	3	4	5	6	7
Can you remember seeing or hearing any reports on the welfare of meat chickens in newspapers or on radio or television?	-.057	.116	.047	-.044	-.047	**.980**	.056

Reason for buying chicken rather than other meat - chicken is healthier	**.732**	.041	.049	.067	-.137	-.089	-.109
Reason for buying chicken rather than other meat - chicken is quick and easy to cook	**.838**	-.044	.030	-.111	.074	.061	.033
Reason for buying chicken rather than other meat - chicken is versatile	**.842**	-.007	-.016	-.040	.043	.016	.055
Reason for buying chicken rather than other meat - chicken is tasty	**.745**	.001	-.063	.097	.016	-.065	-.098
I am concerned about farm animal welfare	-.045	**.888**	.060	-.029	-.029	.086	.032
I am concerned about meat chicken welfare	-.012	**.886**	.074	-.075	.049	.068	.004
Concern for animal welfare affects my purchase decisions	.055	**.735**	-.012	.071	-.148	-.016	.230
Meat from higher welfare chicken is too expensive	.001	-.085	-.010	.025	**.974**	-.047	-.105
How many children under 18 years of age live in your household?	.013	-.031	.001	**.988**	.024	-.042	-.010
Socio-economic group	.000	-.007	**.843**	-.012	.021	.067	.145
What is the highest level of formal education you have achieved?	-.002	.110	**.848**	.011	-.033	-.017	-.081
If you have consumed chicken recently, how often was it free-range chicken?	-.100	.209	.063	-.013	-.110	.061	**.936**

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
Rotation converged in 5 iterations.
The loadings of indicators building the factors are in bold fonts.

Table 3. Factor analysis for 'organic' SEM

	Component						
	1	2	3	4	5	6	7
Can you remember seeing or hearing any reports on the welfare of meat chickens in newspapers or on radio or television?	-.055	.117	.047	-.050	-.045	**.982**	.041
Reason for buying chicken rather than other meat - chicken is healthier	**.726**	.050	.109	-.178	.052	-.082	-.235
Reason for buying chicken rather than other meat - chicken is quick and easy to cook	**.841**	-.046	.001	.085	-.100	.056	.094
Reason for buying chicken rather than other meat - chicken is versatile	**.845**	-.010	-.051	.057	-.027	.010	.125
Reason for buying chicken rather than other meat - chicken is tasty	**.745**	.001	-.039	.002	.093	-.070	-.113
I am concerned about farm animal welfare	-.046	**.885**	.063	-.018	-.032	.085	.037
I am concerned about meat chicken welfare	-.011	**.881**	.075	.064	-.077	.065	.028
Concern for animal welfare affects my purchase decisions	.048	**.746**	-.027	-.170	.074	-.009	.171
Meat from higher welfare chicken is too expensive	.007	-.083	.005	**.960**	.026	-.050	-.122
How many children under 18 years of age live in your household?	.010	-.030	-.001	.024	**.990**	-.044	-.015
Socio-economic group	.003	-.016	**.790**	.049	-.001	.067	.299
What is the highest level of formal education you have achieved?	-.003	.105	**.879**	-.041	-.001	-.009	-.065

If you have consumed chicken recently, how often was it organic chicken?	-.064	.226	.187	-.149	-.017	.042	**.876**

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
Rotation converged in 5 iterations.
The loadings of indicators building the factors are in bold fonts.

Once we had established that latent variables could be identified, we undertook separate factor analyses for the multiple-indicator latent variables ('reason' and 'attidaw'). The individual factor analyses each extracted a single factor, with all variable loadings above the recommended value of 0.7. The total variance of the indicators explained by each of the latent variables was 63 percent and, respectively 72 percent for latent variables 'reason' and 'attidaw', thus confirming the choice of observed variables consistent with their empirical significance.

In the following section we build and test the empirical structural equation model by assigning the relevant relationships between the different latent variables and then discuss the results.

4. Results and discussion

Based on the existing literature it was reasonable to assume a certain amount of underlying causality amongst the variables in the model. Hence we tested the models described in Figures 1 and 2, which present the path diagrams for the estimated models on the stated consumption behaviour of free-range chicken meat and, respectively, organic chicken meat.
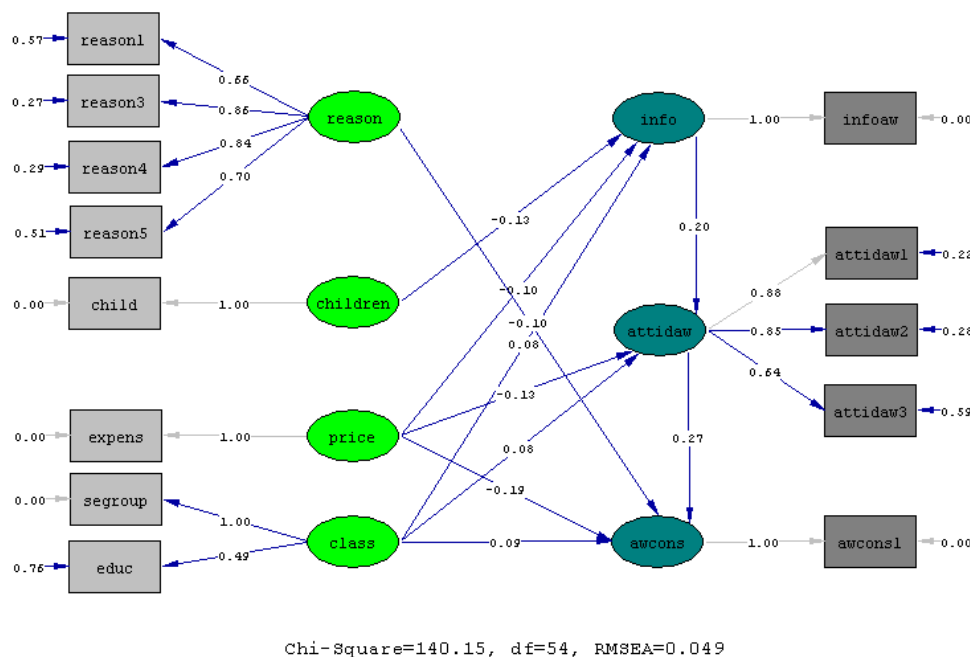

Chi-Square=140.15, df=54, RMSEA=0.049

Figure 1. Path diagram for the estimated model 'free range' (standardised solution)
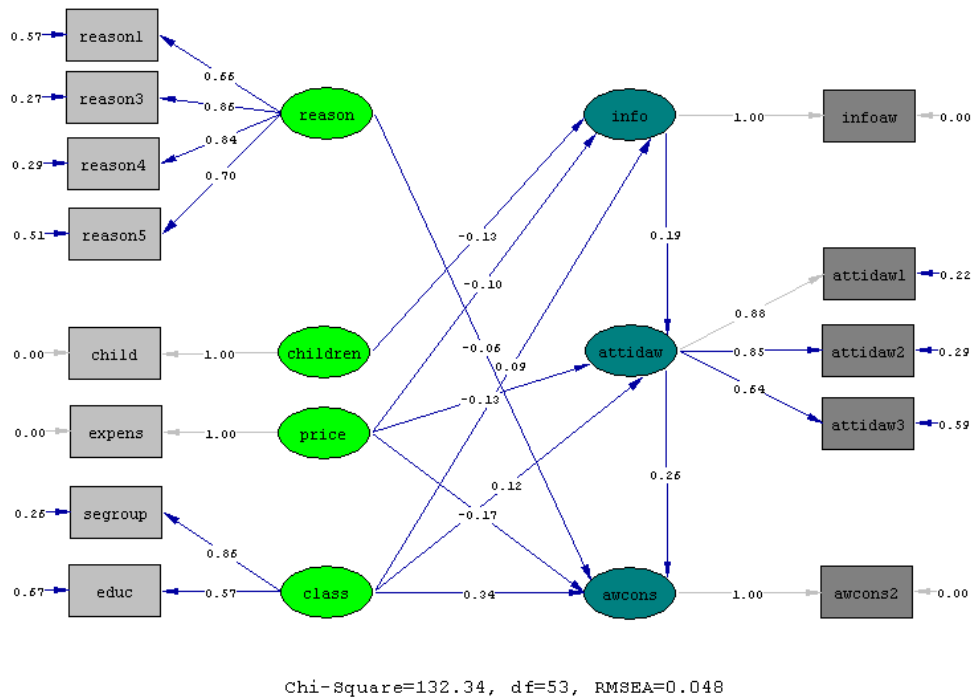
Figure 2. Path diagram for the estimated model 'organic' (standardised solution)

The optimal estimated models include four exogenous latent variables, namely reasons for buying chicken meat (reason) as predictor of consumption of free-range/organic chicken meat (awcons); 'number of children under 18 years of age living in the household' (children) as predictor of access to information (info); perception of the price (price) as predictor of access to information (info), welfare attitudes (attidaw) and consumption of free-range/organic chicken meat (awcons); and socio-economic group (class) as predictor of access to information (info), welfare attitudes (attidaw) and consumption of free-range/organic chicken meat (awcons). Latent variable access to information (info) is a variable with alternating roles, namely endogenous as predicted by 'number of children under 18 years of age living in the household' (children), perception of the price (price) and socio-economic group (class) and exogenous as a predictor of welfare attitudes (attidaw). Latent variable welfare attitudes (attidaw) is also a variable with alternating roles, namely endogenous as predicted by perception of the price (price) and socio-economic group (class) and exogenous as a predictor of consumption of free-range/organic chicken meat (awcons). The behavioural latent variable, consumption of free-range/organic chicken meat (awcons) is endogenous as predicted directly or indirectly by all the other latent variables.

Both models have an adequate fit according to the measures of absolute, incremental and parsimonious fit [9], namely the 'free-range' model shows low chi-square value of 140.15, normed chi-square (ratio between the chi-square and number of degrees of freedom) value of 2.59 within the recommended interval of 1 to 3, root mean square error of approximation (RMSEA) value of 0.049 safely below the threshold maximum value of 0.10, standardised root mean residual (SRMR) value of 0.037 lower than the threshold of 0.08, comparative fit index (CFI) value of 0.96, incremental fit index (IFI) value of 0.96, non-normed fit index (NNFI) value of 0.95, goodness of fit index (GFI) value of 0.97, adjusted goodness of fit index (AGFI) value of 0.95, normed Fit Index (NFI) value of 0.94 and relative fit index (RFI) value of 0.92 are above the cutoff values for fit indices, the 'magic 0.90 or 0.95' [9]. The results of the 'organic' model show even a better fit with very similar values for the goodness-of-fit indicators.

Additional testing of the appropriateness of the models was achieved by comparing each of the estimated models with two other models that acted as alternative explanations to the proposed models, in a competing models strategy (we used a nested model approach, in which the number of constructs and indicators remained constant, but the number of estimated relationships changed). The results across all types of goodness-of-fit measures favoured the estimated models in most cases. Therefore, we confirmed the accuracy of the proposed models and discarded the competing ones.

An acceptable level of overall goodness-of-fit does not guarantee that all constructs meet the requirements for the measurement and structural models. The validity of the SEM is assessed in a two-step procedure, the measurement model and the structural model. The measurement model results show that the sets of indicators for the five multiple-indicator constructs do not all have comparable indicators, however, all loadings are statistically significant. All the coefficients are well above the recommended minimum value of 0.20 [12], thus supporting the theoretical basis for assignment of indicators to each construct.

After assessing the overall model and aspects of the measurement model, we examined the standardised structural coefficients for both practical and theoretical implications. The significance tests for the structural model parameters represent the basis for accepting or rejecting the proposed relationships between exogenous and endogenous constructs. Table 4 shows that all variables in the 'free-range' model have statistically significant coefficients, while all, except variable 'reason', are also significant in the 'organic' model. Table 4 presents the standardised total, direct and indirect effects on the behavioural latent variable of all the other latent variables in the two models.

Table 4. Standardised total, direct and indirect effects on behavioural latent variable (t-values in parentheses)

Observed/latent variables	Direct effect	Indirect effect	Total effect
	Consumption of free-range chicken meat		
reason	-0.10 (-2.64)	0.0	-0.10 (-2.64)
price	-0.19 (-5.14)	-0.04 (-3.12)	-0.23 (-6.08)
child	0.0	-0.01 (-2.59)	-0.01 (-2.59)
class	0.09 (2.52)	0.03 (2.29)	0.12 (3.17)
info	0.0	0.05 (3.93)	0.05 (3.93)
attidaw	0.27 (6.73)	0.0	0.27 (6.73)
	Consumption of organic chicken meat		
reason	-0.06 (-1.49)	0.0	-0.06 (-1.49)
price	-0.17 (-4.88)	-0.04 (-3.08)	-0.21 (-5.78)
child	0.0	-0.01 (-2.54)	-0.01 (-2.54)
class	0.34 (7.65)	0.04 (2.76)	0.38 (8.17)
info	0.0	0.05 (3.76)	0.05 (3.76)
attidaw	0.26 (6.56)	0.0	0.26 (6.56)

The 'free-range' and 'organic' models predict 30% and, respectively, 51% of the variance in consumption behaviour. In terms of individual effects, welfare attitudes have the strongest impact on consumption of free-range chicken meat, while socio-economic group is the strongest determinant of consumption of organic chicken meat. Similar to welfare attitudes and socio-economic group, perception of price has also a sizeable impact on behaviour in both models. The lowest impact on behaviour is that of the number of children in the household, while access to information and reasons for buying chicken meat have slightly higher effects.

Attitudes towards animal welfare significantly impact behaviour in a positive relationship, that is, the stronger the welfare-friendly attitudes the more frequent the consumption of free-range and organic chicken meat. While expected and fitting the literature on attitudes-behaviour relationship [1], the

relationship contradicts some findings from the literature on consumers' welfare-friendly attitudes, where several studies found an overestimated link between stated level of concern and actual behaviour of consumers as regards animal welfare related issues [4]. This is explained by the indicators used to build the latent variable 'attidaw', namely not just stated general welfare concern (indicator 'attidaw1' 'I am concerned about farm animal welfare'), but also more specific concern related to chicken meat welfare (indicator 'attidaw2' 'I am concerned about meat chicken welfare') and directly related to stated consumption (indicator 'attidaw3' 'concern for animal welfare affects my purchase decisions'). The results are similar in the two models, namely a significant positive relationship, slightly stronger in the 'free-range' model (with a total effect of 27%) compared to the 'organic' model (total effect of 26%). The slight difference might be related to the difference in price between the free-range and organic chicken meat products, namely welfare-friendly attitudes might matter more as a determinant of purchase of the free-range than of the more expensive organic products.

Socio-economic group has a significant positive impact on stated behaviour in both models, which shows that more educated people belonging to higher social grades are more likely to consume free-range and organic chicken meat on a frequent basis. These results are as would be expected as social grade can be considered a reasonable proxy for ability to pay [17]. The level of impact, however, differs greatly between the two models, that is, the impact of socio-economic group and education on welfare-friendly consumption behaviour is three time stronger in the 'organic' than in the 'free-range' model (total effects of 38% compared to 12%). There might be more than one reason for this result. One could be related to price, *i.e.*, the more expensive the product (organic compared to free range chicken meat), the stronger the impact of social grade on consumption. Another reason could be related to the fact that consumers' choices of organic chicken meat are often based on a perception of a link between good animal welfare and protection of the environment [19] and attitudes towards environmental protection are also positively associated with education and income (or, here, socio-economic group used as a proxy).

We found a negative relationship between common reasons to buy chicken meat (health, convenience) and consumption of free-range or organic chicken meat. That is, people who buy chicken meat because it is more convenient (quick and easy to cook, versatile) are less inclined to spend more for the free-range or organic choice. People who buy chicken meat because they perceive it as healthier than other meats might be satisfied will the level of safety of chicken meat and do not go the extra mile to buy the more expensive welfare or environmentally friendly versions. This may relate to findings from the literature [19]; [21] stating that food safety features as a more prominent issue for consumers than animal welfare. Despite perceptions of low welfare in broiler production, some consumers view poultry meat as being 'healthier' than beef or pork due to the belief that it contains less fat and fewer 'harmful substances' [19].While its impact is significant in the 'free-range' model, it is not so in the 'organic' model. These relationships need further investigation, such as assessment of separate impacts of 'healthy' and 'convenience' reasons on consumption of welfare and environmentally friendly chicken meat. In the current model the effects could not be split between two latent variables as all indicators loaded significantly on the same factor.

The variable 'children' was found not significant in previous versions of the models as direct determinant of consumption behaviour, however it was found significant as determinant of perception of welfare information and therefore indirect determinant of behaviour and, moreover, it improved the fit of the estimated models. Unexpectedly, it has a negative impact on variable 'info', which means that people with more children in the household are less inclined to take notice of reports on the welfare of meat chickens in newspapers or on radio or television. It is unlikely that the majority of consumers perceive any negative relationship between free-range or organic food products and food safety (see, for instance, [20], who state that consumption of free-range chicken eggs may often result in substantially higher dioxin and dioxin-like PCB doses than consumption of barn or cage eggs). On the contrary, welfare-friendly and organic food products are viewed as safer and, therefore, one would expect that families with children in the household would be more perceptive of information on the welfare of meat chickens. Therefore the fact that the number of children in the household has a negative impact on perception of animal welfare information might be related to income issues. This issue needs further investigation.

The relationships between behaviour and the remaining two latent variables are as expected and confirm findings from the literature. Namely, access to information on welfare issues significantly impact welfare attitudes, that is, the more recent access to information acknowledged by the respondent, the stronger their welfare attitudes and, indirectly, the stronger the welfare-friendly consumption behaviour. On the other hand, perception of price significantly impacts behaviour in a negative relationship, meaning that

the more expensive the product is perceived by the consumer, the lower the consumption of welfare-friendly products.

5. Conclusions

This paper analysed the determinants of British consumers' behaviour towards animal welfare using structural equation models (SEM) with observed and latent variables. The models included observed and latent variables representing behaviour (purchases of free-range and organic chicken meat) and its underlying determinants (attitudes towards animal welfare and socio-economic factors). The results of the structural equation model on free-range chicken meat purchasing behaviour show socio-economic group, education, attitudes towards animal welfare, reasons for buying chicken meat, access to information on animal welfare issues, number of children and price as significant determinants of behaviour. All of these (with the exception of reasons for buying chicken meat) were found significant also in the model on organic chicken meat purchasing behaviour. While attitudes towards animal welfare were found to be the main determinant of free-range chicken meat purchasing behaviour, socio-economic group was by far the most important factor influencing purchases of organic chicken meat. Price of free-range and organic products was also found to have a strong influence on purchasing behaviour. Access to welfare information and number of children living in the household had the lowest but still significant impact on welfare-friendly behaviour.

The paper tested and estimated the impact of some *a priori* determinants on consumers' welfare-friendly behaviour represented by stated purchasing behaviour of free-range and organic chicken meat. This is indeed only one aspect of consumers' behaviour as regards animal welfare issues and, as [15] note, the picture is incomplete if we are to focus on purchase decisions as in fact there is more human welfare related to good animal welfare that lies beyond market transactions. While the scope of this paper was to understand some of the influences on consumers' stated purchasing behaviour, more research is needed on understanding other features of their welfare-friendly behaviour.

Acknowledgment

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